Verruca Plantaris

WAYNE WRIGHT, M.D., Oakland

• *Various methods were used in the treatment of 451 patients with verruca plantaris who were observed for a period of nine months after treatment. Results obtained by the various methods were as follows:*

	No. Patients	Cured	
		No.	Per Cent
Electrocautery	35	24	64
Trichloroacetic acid and 40% salicylic acid plaster	56	36	65.3
20% podophyllin	43	26	64.2
Local injection of 1% procaine	70	34	48.5
Liquid nitrogen	62	48	78.7
Carbon dioxide snow	48	31	64.4
X-ray therapy	83	61	73.4
Euphorbium resin	54	39	72.2
Controls	63	3	.047

TODAY THE STATUS of the therapy of plantar warts is, as it was before the era of so called modern medicine, unsatisfactory. The number and the variety of types of therapy advocated by numerous investigators bear witness.

The incidence of plantar warts probably is much greater than most physicians suspect. By direct questioning and examination of the feet of each patient visiting a dermatologic clinic for other reasons, it was found that one in every 26.3 persons had a plantar wart at the time; and in young active male military personnel one in every 16.7 persons had a plantar wart at the time of examination. Many of the persons who had plantar warts said that they had been treated without success and that, as the treatments were usually as painful as the wart, they just tried to ignore its presence. Others who had warts thought they had callous formation, and some of them bought pads or special shoes to relieve discomfort, usually without success.

Since 1950 the author has kept complete records of all cases of plantar warts observed by him and has attempted follow-up observation of patients for at least nine months after treatment. Personal observation was carried out when possible, and reports of other physicians were used when personal observation was not possible. Note was made of objective and subjective symptoms at three, six and nine-month intervals after therapy. Up to May 1954, records of 451 patients who had been observed three times were available.

The methods of therapy used and the number of patients treated with each method were as follows:

1. Electrocautery, with excision of area by wire loop 35
2. Trichloroacetic acid and 40 per cent salicylic acid plaster 56
3. Twenty per cent podophyllin in tincture benzoin and salicylic acid plaster 43
4. Local injection of 1 per cent procaine into the wart 70
5. Liquid nitrogen at weekly intervals 62
6. Carbon dioxide snow at weekly intervals 48
7. X-ray therapy 83
8. Euphorbium resin at 48-hour intervals 54

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These eight types of therapy were selected as being most nearly representative of the methods currently used and reported in the literature to be successful. It is realized that there are many other procedures which probably give results as good or better, but it was impossible to include them.

The term "cure" as used in this paper means complete relief of symptoms for a six-month to nine-month period without recurrence of the verruca in the treated site.

Electrocautery[5]

Treatment of plantar warts with the use of cutting current and a wire loop which is inserted into the wart, after use of a local anesthetic agent, and rotated 180 degrees is a procedure that has long been used and still has many advocates. This method was used in 35 cases in the present series. All patients were kept off their feet for three days after the treatment and those in the military service were unable to return to full duty for a period of 15 to 30 days. All patients complained of the pain for many days following the operation and several said they would much rather have "kept the wart."

In seven cases recurrences developed at the site in less than 90 days and in two other cases within nine months. One patient had a very painful scar at the site of operation after the wound was healed.

In view of the rather high incidence of recurrence this mode of therapy was not used further and it is considered to be the least desirable of the accepted modes of treating plantar warts.

Trichloroacetic Acid and Salicylic Acid Plaster

Modifications of trichloroacetic acid therapy with or without the salicylic acid plaster have been used for many years. Trichloroacetic acid is prob-

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ably no better than any other destructive agent such as silver nitrate or phenol. The 40 per cent salicylic acid plaster is a valuable supplement and it can be used by the patient between treatments after only minimal instructions as to how it should be applied.

Fifty-six patients were treated by this method in the present series. Thirty-six were deemed cured, 31 of them in four treatments and five in five treatments. In 20 cases seven treatments were given and the result was classified as a failure. The cure rate was with five recurrences over a nine-month period.

In view of the necessity of repeated treatments at weekly intervals and the resulting tenderness of the treated areas, it is difficult to keep the patients returning for the required number of treatments. Therefore it is not regarded as one of the preferable methods of therapy.

The use of 20 per cent podophyllin in tincture of benzoin and 40 per cent salicylic acid plaster was used in 43 patients and the cure rate was 64.2 per cent. This only added to the conviction that any destructive agent will give about the same results. Podophyllin is specific in the therapy of verruca accuminata, however.

Injection with 1 Per Cent Procaine[1]

In 1951 Branson[1] first reported dramatic relief in verruca plantaris after injection of 1 per cent procaine. Branson and Rhea[2] later amplified the report of this method.

The reports stated that the method was painless and the results excellent. The procedure involves the injection of 2 or 3 cc. of 1 per cent procaine into the base of the wart, using a 26-gauge needle and a Luer dental syringe. Branson and Rhea postulated that cure results from ischemic necrosis.

Seventy of the patients in the present series were treated by this method, beginning in 1952 and continuing to the time of this report. The results did not match those of Branson and Rhea.

First of all, it soon became apparent that this is not a painless mode of therapy. All patients objected to the initial pain of the injection, which lasts up to about three minutes before the procaine "deadens" the area. This pain and the presence of the needle make it impossible to treat most children, and many women say they will not again tolerate the procedure.

A syringe of the cartridge type is by far superior to the Luer syringe when injection of the plantar aspect of the foot is done, for less effort is required on the part of the operator.

Of the 70 patients treated 34 were cured. Ten required only one injection and 24 needed two injections. In 36 cases treatment was considered a failure after five injections. Thus the cure rate was 48.5 per cent. It was impossible to obtain more than a few hours of relief in cases in which the wart did not disappear.

In view of the possibility that the base of the wart was not being properly infiltrated as Branson and Rhea said is necessary, the author obtained the services of an anesthesiologist to make the injection in 25 of the cases. The results were unchanged.

Liquid Nitrogen Therapy

A cotton-tipped applicator dipped in liquid nitrogen and applied with pressure for 30 to 90 seconds to the pared wart was used in 62 cases. The treatment causes pain both during and after the application for a period varying from 30 minutes to two days depending on the amount of pressure exerted and the length of time applied. Patients described the sensation as "burning" in nature and more intense than that of carbon dioxide snow. This can probably be explained on the greater tissue reaction obtained by the difference in temperature: The temperature of liquid nitrogen is minus 183° C. and of carbon dioxide snow minus 79° C.

It is important that enough pressure be used and the liquid nitrogen held in place long enough to cause intense edema with formation of a small vesicle under and around the verruca plantaris. This vesicle will often contain some bloody serum that the patient may speak of as a "blood blister." This usually develops between 12 and 30 hours after the treatment.

The subject is asked to return in 36 to 48 hours and the wart then usually can be scooped out with a pair of iris scissors or a scalpel blade. The area heals rapidly. In all cases observed by the author the scar was soft and pliable.

Some patients would not tolerate the application of the liquid nitrogen and preferred the pain of 1 per cent procaine injection. In addition, some patients who were treated first with procaine, later had liquid nitrogen therapy. Thus a combination of the procaine infiltration method and the liquid nitrogen method was used in these cases.

Theoretically, better results should be obtained by using a combination of both than with either alone. Such was not the case, however. The cure rate in cases in which both methods were used was higher than with the use of the 1 per cent procaine infiltration alone but was not higher than with liquid nitrogen alone.

Of the 62 patients, 48 were considered cured—a cure rate of 78.7 per cent. Twenty-seven patients responded to the first treatment and 20 required two treatments. One needed three treatments. In the remaining cases when the warts did not disappear after five treatments, the method was deemed to have failed.

Carbon Dioxide Snow Therapy[7]

Carbon dioxide snow therapy was used on 48 patients with one or more plantar warts of more than six weeks' duration. They were treated by paring the warts until bleeding points were reached and then applying the carbon dioxide snow in pencil form with pressure, for about 60 seconds. The only change in method from that used by the author in a previously reported series[7] was that adhesive was applied over the area and the patient told to keep it or a fresh piece of tape in place until the next visit. The patient was told to return in about a week, when an attempt was made to scoop out the wart with iris scissors or a blade. If it could not be scooped out, carbon dioxide snow was again applied and the patient was told to return in three days, since the reaction is more rapid after the second treatment. Often the patient would pull the wart out when changing the adhesive tape at home.

Thirty-one (64.4 per cent) of the 48 patients were cured—11 after one treatment, 16 after two and four after three treatments. In the remaining 17 cases the method was deemed a failure after five treatments without disappearance of the warts.

Euphorbium Resin[3]

Fifty-four patients were given euphorbium resin therapy.[3] (The results here reported were based upon observation for a period of six months.)

The warts were pared down and a 30 per cent solution of euphorbium resin in alcohol was applied directly to the area and covered with adhesive tape for 48 hours. Then the procedure was repeated, if necessary, until the verruca could be "shelled" out. This is the method described by Curtis and Goldblum.[3]

Of the 54 patients treated, 39 were regarded as cured. No patient responded to the first treatment; 16 were cured in two treatments and 23 in three treatments. In the remaining 15 cases the therapy was regarded as a failure after six treatments. Thus the cure rate was 72.2 per cent, with three recurrences in the same site in the six-month period. Curtis and Goldblum[3] reported a cure rate of 90 per cent.

To check the quality of the euphorbium resin being used, a supply was obtained from the University of Michigan pharmacy. This euphorbium was used in 31 patients. They were not included in this report, as the period of observation was too short, but the initial response was within 2 per cent of that in the original 54 patients.

The only other reference to therapy of this type is on page 77 of the 1953-54 Year Book of Dermatology and Syphilology,[6] in which the editors commented that they were not impressed with the results in the few cases in which they tried it.

The merits of this approach to the treatment of plantar verrucae are that it is relatively painless and one can usually determine the success or failure of the method in about 96 hours. Also the resin of euphorbium is inexpensive and stable.

X-ray Therapy

Roentgen therapy was not given to any of the patients in the present series at the first visit. The patients here reported upon were sent directly to the radiology department by referring medical officers specifically for x-ray therapy. Eighty-three such patients were observed for a period of nine months.

The dosage used varied with the size of the verruca; it was usually 1,200 r in one treatment or two treatments of 600 r. For smaller warts the dosage was increased. Of the 83 patients, 61 (73.4 per cent) were considered cured, and four had recurrences at the same site.

Thus x-ray therapy produced a slightly higher cure rate, with no more recurrences, than any of the other methods of therapy with the exception of liquid nitrogen. X-ray has three definite advantages: It is fairly effective, is easy to administer if equipment is available with trained operators, and is painless and clean. There are also some distinct disadvantages: It is dangerous if improperly used; it is possible for patients to deliberately or inadvertently forget they had x-ray and get repeat therapy (in event of a recurrence or failure) usually from another physician, with resulting radiation necrosis and all the problems that accompany it; and not many physicians have a machine available.

The possible serious complication of x-ray therapy may outweigh the advantages and therefore this method was used only as a last resort.

Excision of Plantar Condyles of the Metatarsal Heads[4]

The author has had no experience with the new approach to intractable verruca plantaris reported by DuVries.[4] Mention is made of it only for completeness. When the cases in the present series were reviewed, however, it was felt that there were no patients who would have required this surgical therapy. The biggest objection to this approach is the one that applies to any operation on the plantar aspect of the foot, including electrodesiccation: A painful scar may develop, which is usually a bigger problem than the original verruca.

CONTROLS

As paring down the wart is the first step in all types of therapy with the exception of procaine infiltration, it was decided to use this paring process on patients kept as controls.

Owing to the possibility of psychotherapy as a factor in dealing with warts, normal saline solution was applied and the area covered with adhesive tape after paring. The patients were not told what solution was being painted on the verruca. These patients were seen at two-week intervals as long as they would return for observation.

Sixty-three patients were seen every two weeks for a period of six months. Subjective symptoms were completely relieved in 29 patients (46 per cent) as long as the wart was kept trimmed, and were relieved to some extent in most cases. Only two patients said they had no relief at all. It is interesting to note that only three plantar warts spontaneously disappeared in the six-month observation period, even though symptoms were relieved. If one paring was skipped, the symptoms returned in direct ratio to the development of hyperkeratosis.

Controls were actively treated at the end of the six-month period, as a longer period of observation was not considered fair to the subject.

DISCUSSION

If one were to postulate the requirements of an ideal therapeutic agent for plantar warts, the following points should be included: It should be safe, effective, relatively painless, inexpensive, administrable by any physician without need of special equipment, and be such that the patient could remain ambulatory during therapy.

None of the eight different methods of therapy used in this study approached the standards of an ideal agent.

The highest percentage of "cures" was obtained with the use of liquid nitrogen. This slight advantage in effectiveness is somewhat offset by the lack of availability of the method. Only in the larger metropolitan centers is a ready supply of liquid nitrogen at hand. A special insulated container must be used because of the rapid evaporation and the low temperature. Liquid nitrogen costs more than other topical agents but it is still relatively inexpensive near a source of supply.

X-ray therapy gave the next highest "cure rate." The cleanliness, absence of pain and the fact that only one or two treatments are needed has made it the method of choice of many physicians even though it may mean referring the patient. Patients who have been treated by this means or who have heard about it from others, often ask specifically for x-ray therapy.

Impressive instruction of the patient about x-ray therapy is most important. Each patient who is given x-ray therapy of any kind should be given a diagram of the part treated with the site that received the ionization precisely outlined. All factors and the dosage should be included. Some physicians supply this to their patients; others feel it best to wait until the information is requested by another physician and then supply it to him.

The fact that some patients forget intentionally or unintentionally that they ever received roentgen therapy is well known. If the patient is given a card at the time of therapy and impressed that he should show it to any other physician who might treat him, the psychological impact may be enough to make him comply. It should be stressed that x-ray therapy given by a physician trained in its use is perfectly safe. However, it should be given only after other procedures fail—not as initial therapy.

Euphorbium resin most nearly fits the requirements of the "ideal agent." It is not as effective as an ideal agent should be, but it approaches or equals all other modes of therapy in effectiveness. The cost of the agent is almost nothing. Patients object very little to the slight irritation at the site of application. At the end of 96 hours, one can usually tell if the therapy is going to be successful. No special equipment is needed, and the patient remains ambulatory.

Carbon dioxide snow can be utilized by physicians who like cryotherapy and do not have a source of liquid nitrogen. If more pressure is used for a longer period of time—up to 120 seconds—the effectiveness of carbon dioxide snow should approach that of liquid nitrogen.

In the present series the location of the verrucae did not seem to influence the response. Many observers have expressed the opinion that a plantar wart at the base of the first metatarsal is more difficult to cure than one located elsewhere on the sole of the foot.

Although none of the agents used in therapy were highly effective, it is important to note that all gave results superior to those noted in the untreated controls.

400 Twenty-ninth Street, Oakland 9.

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